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Jeong et al.

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(54) **ORGANIC LIGHT-EMITTING DISPLAY DEVICE HAVING SOURCE DRIVE INTEGRATED CIRCUITS AND DRIVING METHOD THEREOF**

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G09G 3/28	(2013.01)
G09G 3/34	(2006.01)

(52) **U.S. Cl.**

CPC ***G09G 3/3258*** (2013.01); ***G09G 3/2088*** (2013.01); ***G09G 3/3618*** (2013.01); *G09G 3/28* (2013.01); *G09G 3/3406* (2013.01)

(58) **Field of Classification Search**

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See application file for complete search history.

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(57) **ABSTRACT**

An organic light-emitting display device includes: a display panel including: a plurality of pixels configured to display an image, each pixel among the plurality of pixels including a driving transistor and a sensing transistor, a plurality of data lines respectively connected to each driving transistor, and a plurality of sensing signal lines respectively connected to each sensing transistor, a plurality of source drive integrated circuits (ICs) configured to: supply data voltages to the plurality of data lines, and supply sensing voltages to the plurality of sensing signal lines, and a timing controller configured to supply digital video data and a data timing control signal to the source driver ICs, wherein each of the plurality of source driver ICs includes a sensing voltage supply unit configured to generate the sensing voltages.

10 Claims, 6 Drawing Sheets

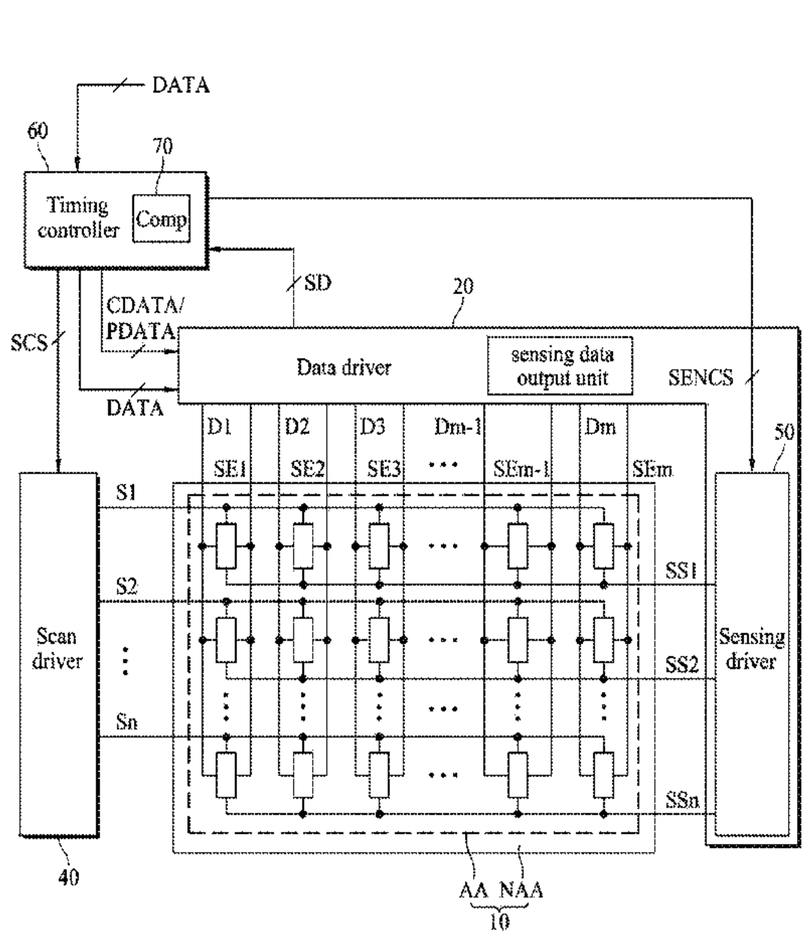

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FIG. 1

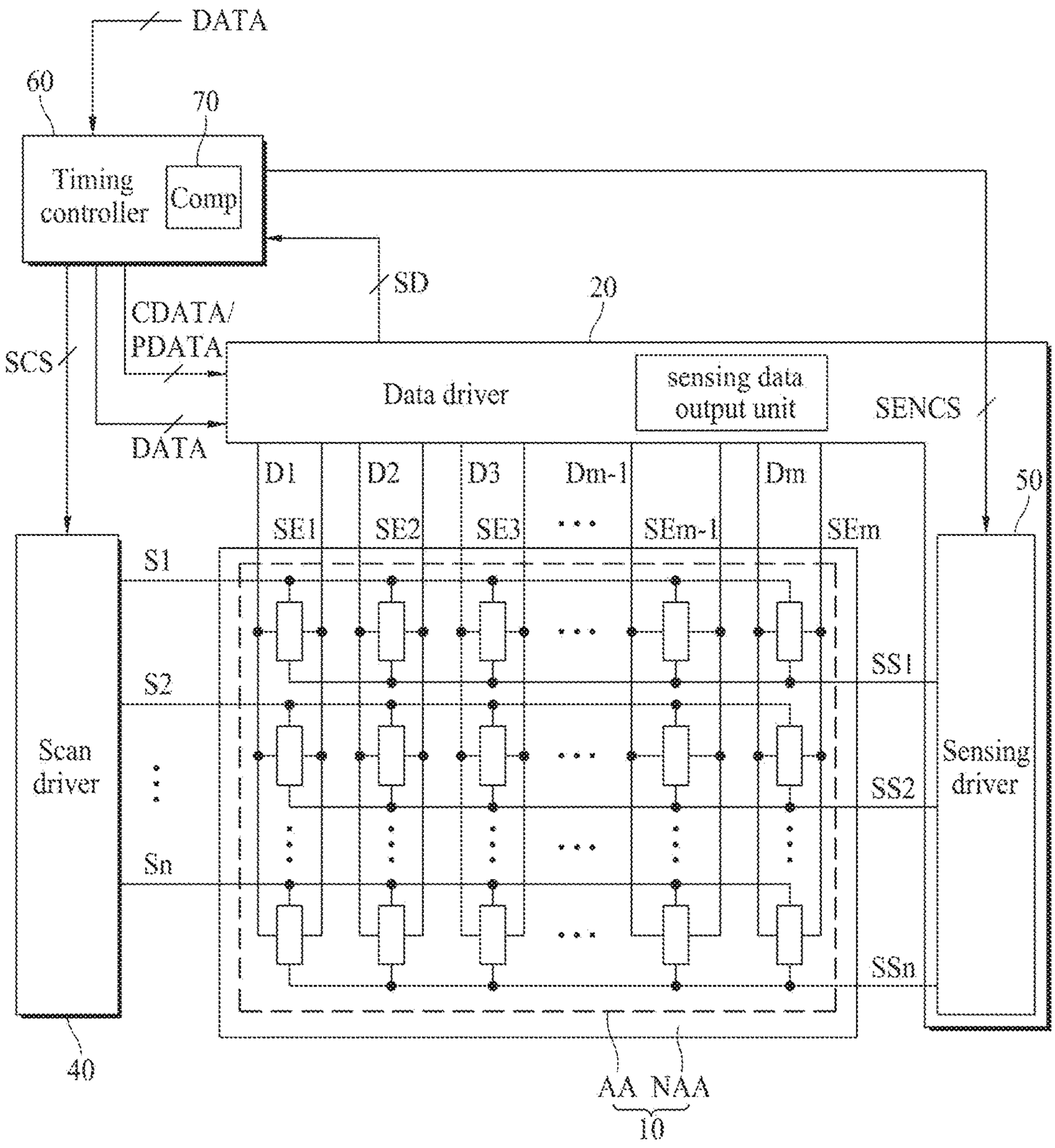

DATA
60
70
Timing controller
Comp
SD
20
CDATA/ PDATA
SCS
Data driver
sensing data output unit
SENCS
DATA
D1
D2
D3
Dm-1
Dm
50
SE1
SE2
SE3
SEm-1
SEm
S1
S2
SS1
Scan driver
SS2
Sensing driver
Sn
SSn
40
AA
NAA
10

FIG. 2

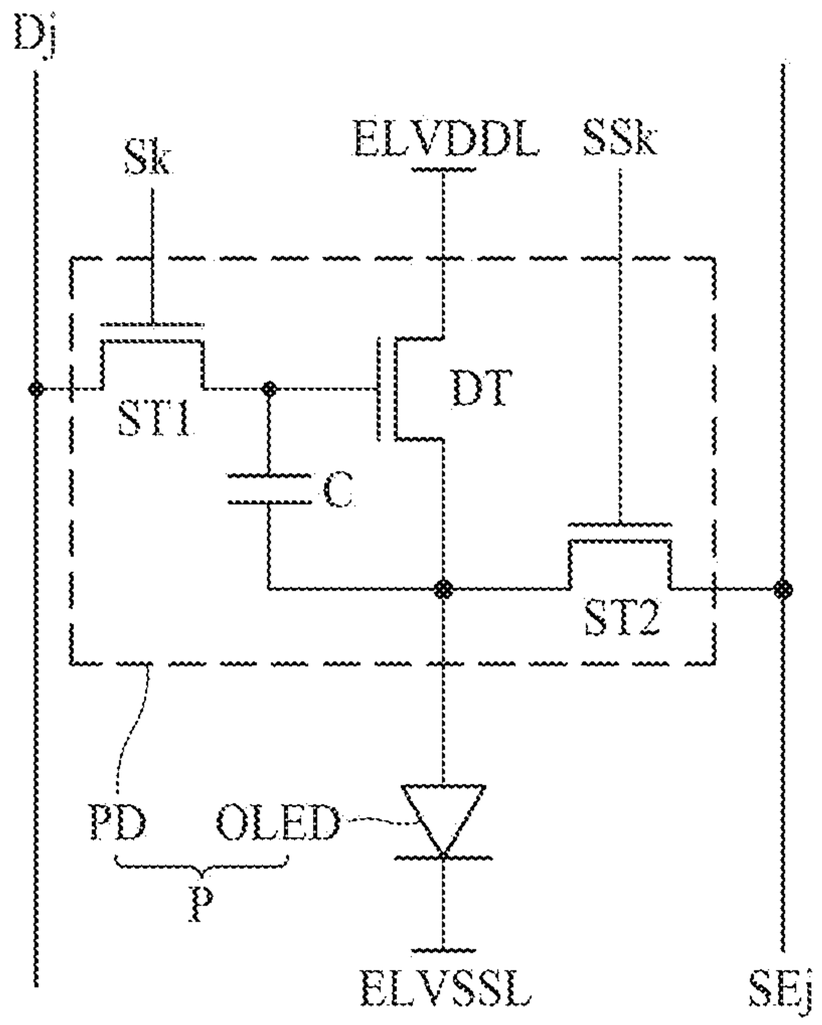


FIG. 3

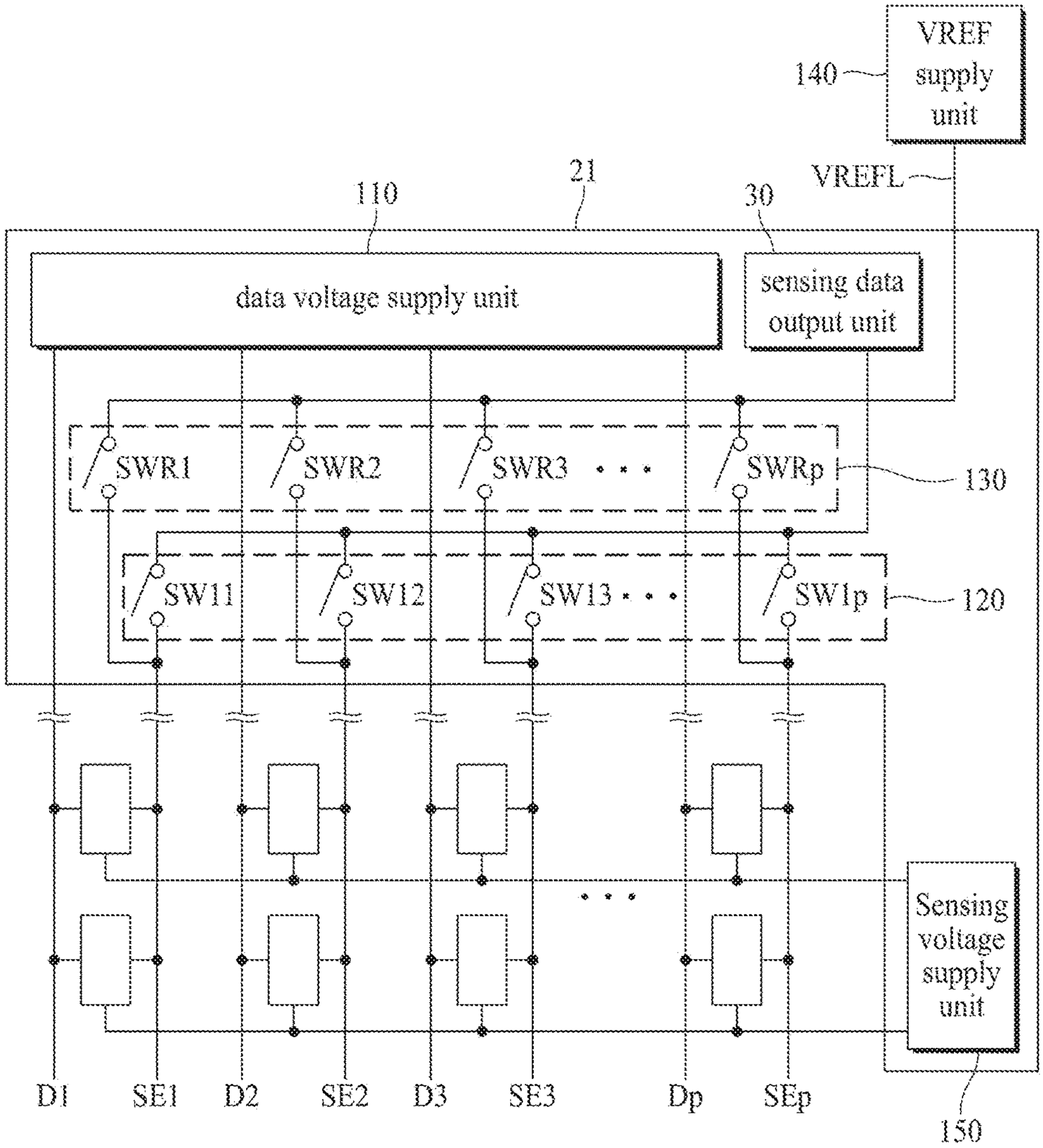
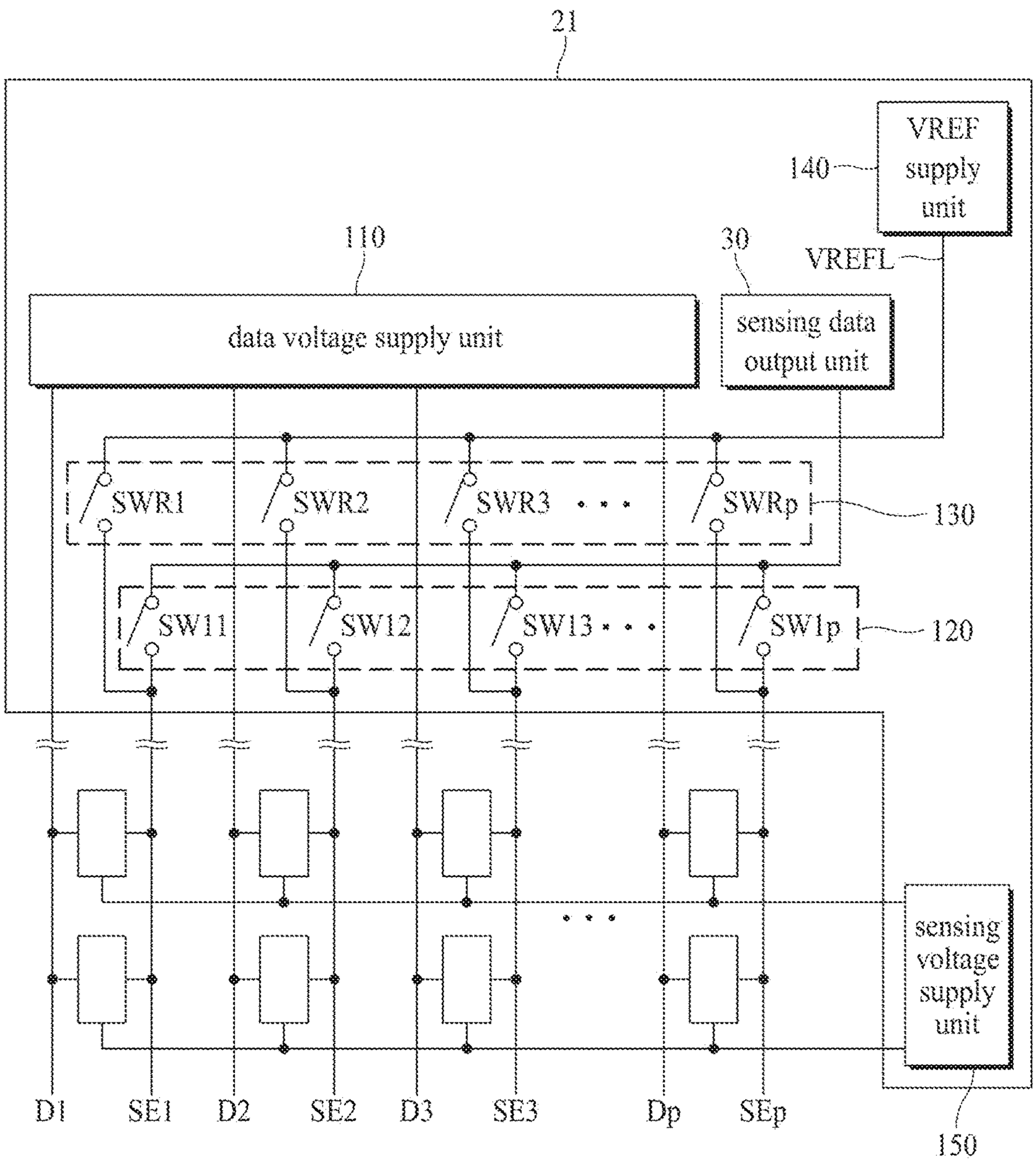

140
VREF supply unit
VREFL
21
110
30
data voltage supply unit
sensing data output unit
SWR1
SWR2
SWR3
SWRp
130
SW11
SW12
SW13
SW1p
120
Sensing voltage supply unit
150
D1
SE1
D2
SE2
D3
SE3
Dp
SEp

FIG. 4


21
VREF supply unit
140
110
30
VREFL
data voltage supply unit
sensing data output unit
SWR1
SWR2
SWR3
SWRp
130
SW11
SW12
SW13
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sensing voltage supply unit
D1
SE1
D2
SE2
D3
SE3
Dp
SEp
150

FIG. 5

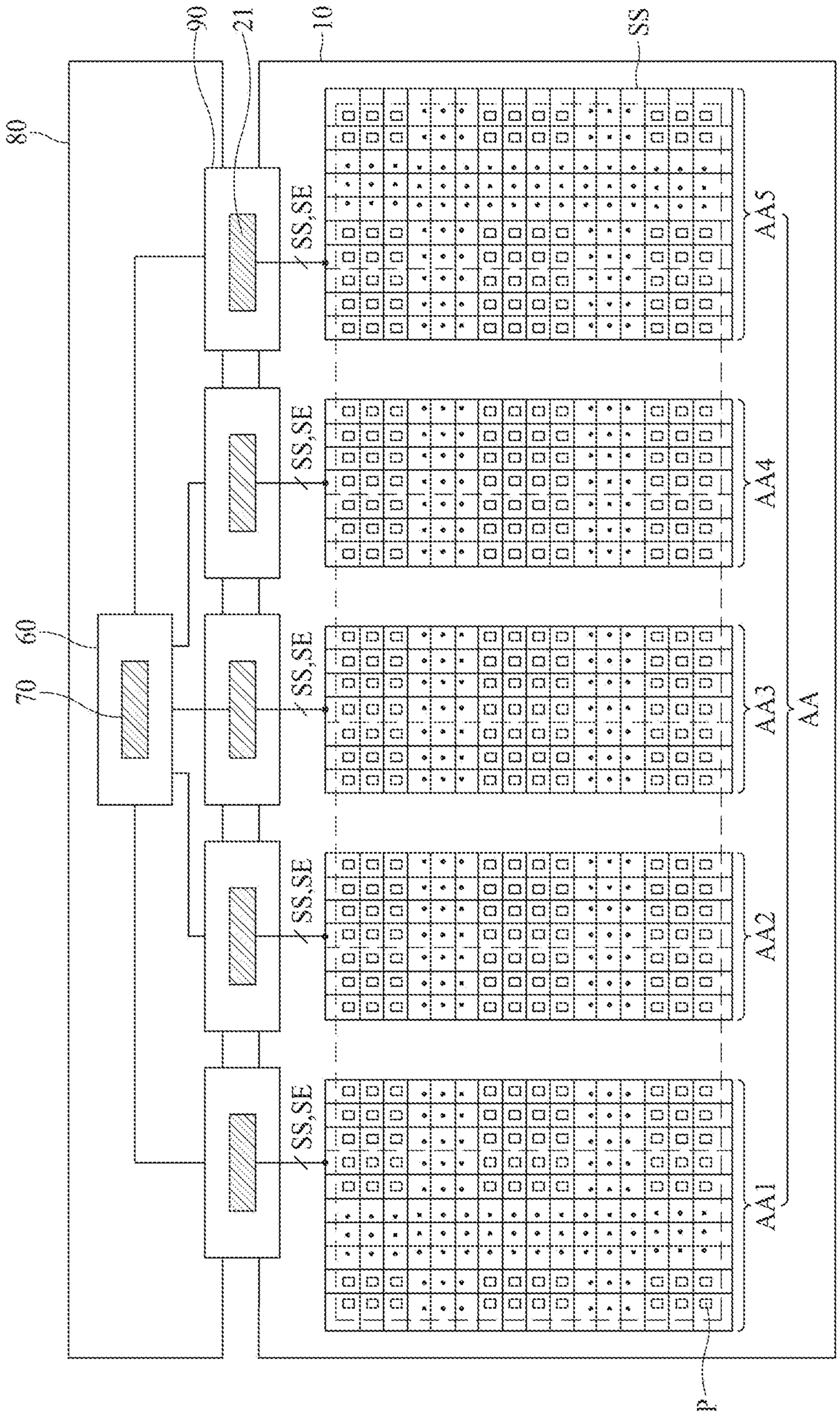


FIG. 6

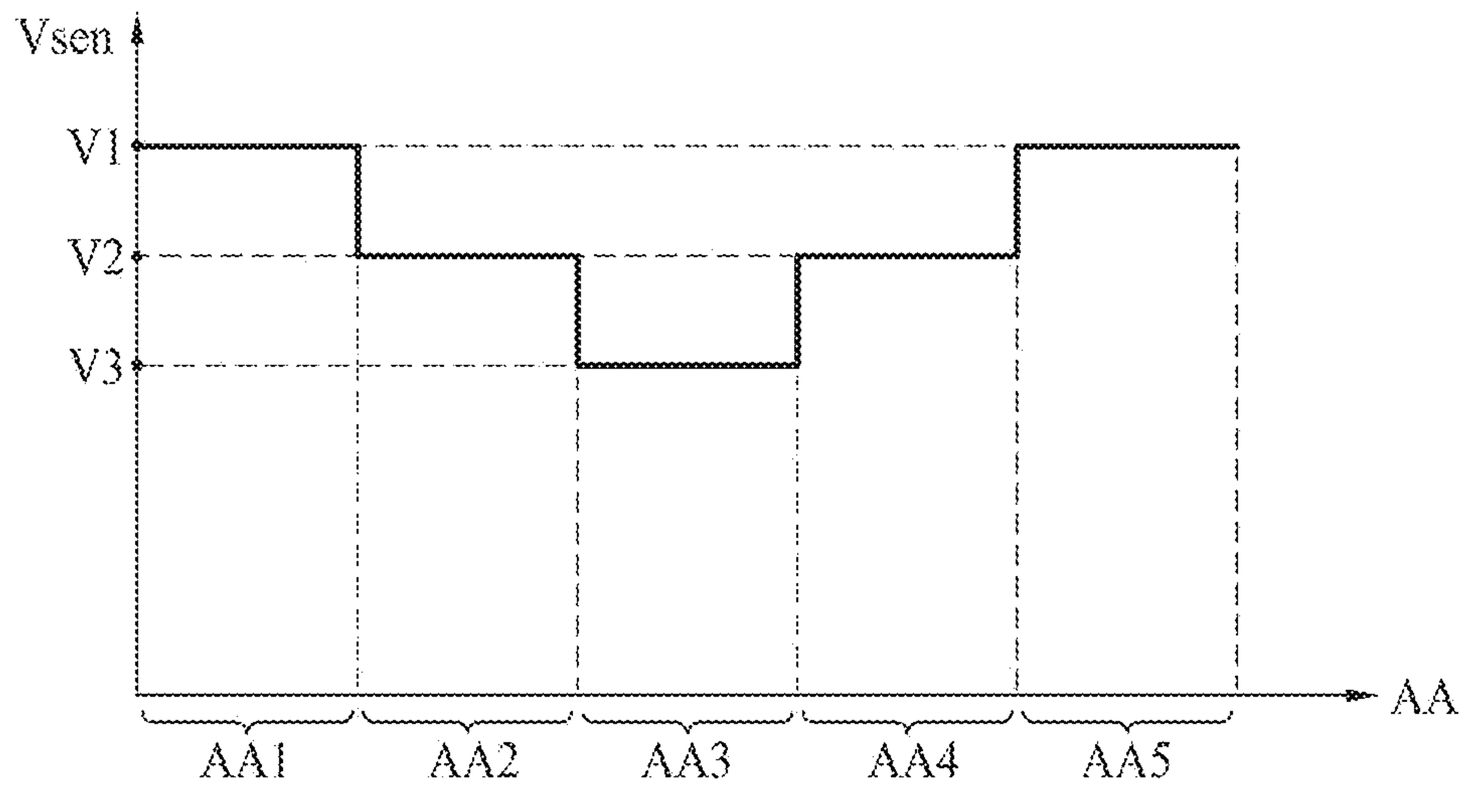
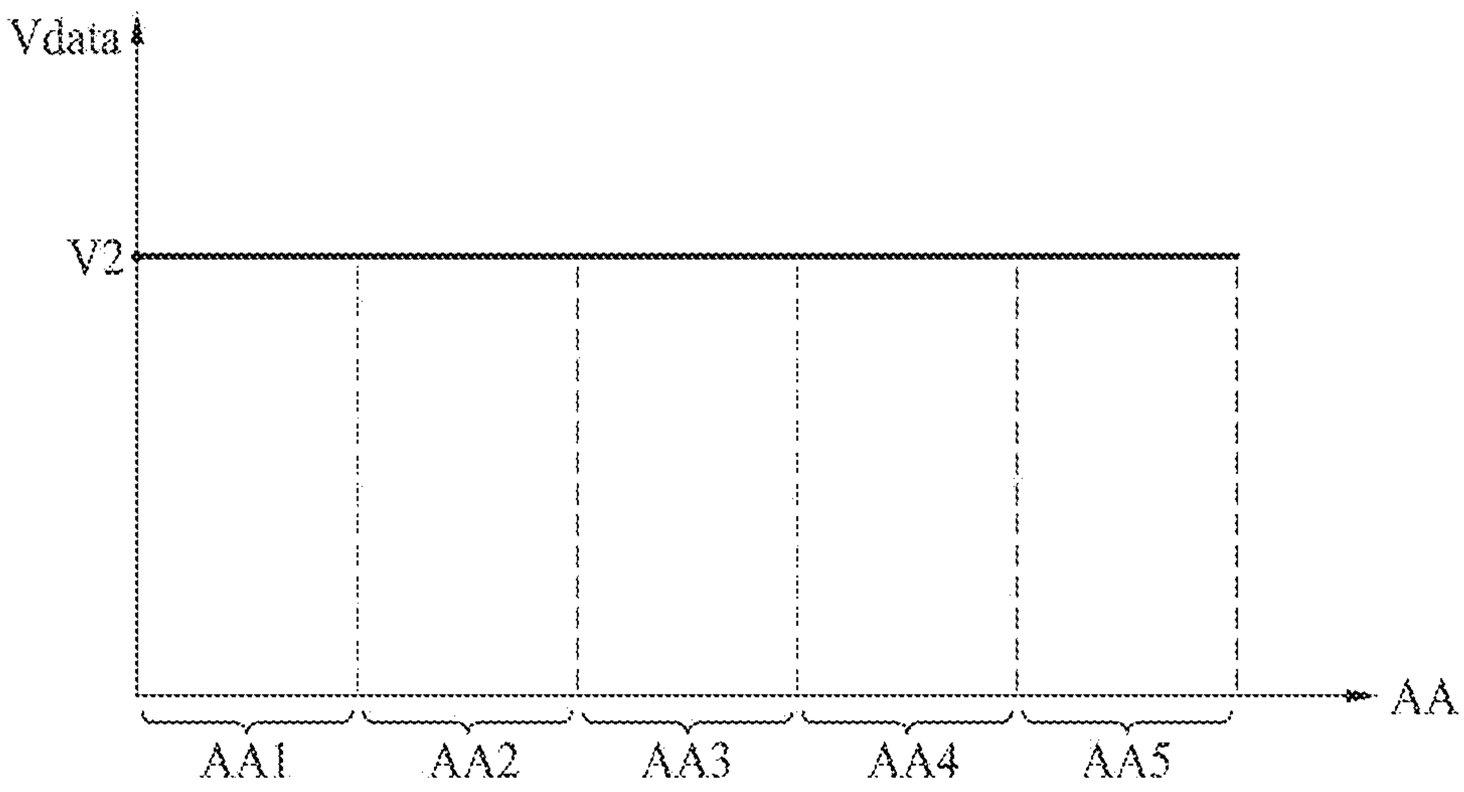

Vsen
V1
V2
V3
AA
AA1
AA2
AA3
AA4
AA5

FIG. 7


Vdata
V2
AA
AA1
AA2
AA3
AA4
AA5

ORGANIC LIGHT-EMITTING DISPLAY DEVICE HAVING SOURCE DRIVE INTEGRATED CIRCUITS AND DRIVING METHOD THEREOF

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the priority of Korean Application No. 10-2016-0096784, filed on Jul. 29, 2016, the entirety of which is hereby incorporated by reference.

BACKGROUND

1. Technical Field

The present disclosure relates to an organic light-emitting display device and a driving method thereof.

2. Discussion of the Related Art

With the advancement of an information-oriented society, various desires for display devices for displaying an image are increasing. Therefore, various display devices, such as liquid crystal display (LCD) devices, plasma display panel (PDP) devices, organic light-emitting display devices, etc. have been used recently.

Among these display devices, the organic light-emitting display devices are driven with a low voltage and are thin, and have a good viewing angle and a fast response time. The organic light-emitting display devices each include a display panel that includes a plurality of data lines, a plurality of scan lines, and a plurality of pixels respectively provided in a plurality of areas defined by intersections of the data lines and the scan lines, a scan driver that supplies scan signals to the scan lines, and a data driver that supplies data voltages to the data lines. The plurality of pixels each include an organic light-emitting diode (OLED), a driving transistor that controls the amount of current supplied to the OLED according to a voltage at a gate electrode thereof, and a scan transistor that supplies a data voltage of a data line to the gate electrode of the driving transistor in response to a scan signal of a scan line.

Due to differences in processes occurring in manufacturing an organic light-emitting display device or a threshold voltage shift of a driving transistor caused by long-time driving, the threshold voltages and electron mobility of driving transistors of pixels differ. Therefore, when the same data voltage is supplied to the pixels, the currents of the driving transistors supplied to OLEDs should be the same. However, despite the same data voltage being supplied to the pixels, the currents of the driving transistors supplied to OLEDs differ due to a threshold voltage difference and an electron mobility difference between the driving transistors of the pixels. As a result, even when the same data voltage is supplied to the pixels, light emitted from the OLEDs of different pixels have different luminances. To solve such problems, a compensation method of compensating for threshold voltages and electron mobility of driving transistors has been proposed.

The compensation method may be categorized into an "internal" compensation method and an "external" compensation method. The internal compensation method senses and compensates for a threshold voltage of a driving transistor in each pixel. The external compensation method supplies a predetermined data voltage to each pixel and senses a current of the driving transistor through a sensing line according to the predetermined data voltage. Subsequently, the external compensation method converts the sensed current into digital video data and compensates for

digital video data to be supplied to each pixel, based on the digital video data obtained through the conversion.

The organic light-emitting display device uses a supply voltage from a power source built into a control printed circuit board (C-PCB) outside a source drive integrated circuit (IC) to generate a sensing voltage and a data voltage necessary for performing the external compensation method and a reference voltage for controlling a luminance of an entire display panel. The source driver IC performs sensing based on the external compensation method by using the voltages supplied thereto.

In the organic light-emitting display devices of the related art, if the sensing voltage is supplied from C-PCB, areas disposed on sides, e.g., a left end and a right end, of the display panel are farther away from the C-PCB than an area disposed on a center of the display panel. Therefore, because a resistance caused by a line is high, a low sensing voltage is supplied. When the sensing voltage is lowered, even when the same data voltage and reference voltage are supplied, compensation is performed differently. Therefore, as time elapses, a difference occurs between the data voltage and the reference voltage. As such, a luminance deviation between areas of the display panel occurs.

Furthermore, in addition to the sensing voltage, the data voltage and the reference voltage are differently supplied, depending on an area characteristic of the display panel. Because the areas disposed on the sides, e.g., the left end and the right end, of the display panel are farther away from the C-PCB than the area disposed on the center of the display panel, when the data voltage and the reference voltage are supplied from the C-PCB, a resistance caused by a line is high. Also, the physical characteristics of pixels provided in the areas disposed on the sides, e.g., the left end and the right end, of the display panel can differ from those of the area disposed on the center. For this reason, luminance in the areas disposed on the sides, e.g., the left end and the right end, of the display panel is more reduced than luminance in the area disposed on the center, causing a luminance deviation between the areas of the display panel.

Particularly, in large organic light-emitting display devices, a physical characteristic difference between the pixels provided in the display panel and a length difference of lines connected between the C-PCB and the display panel occur, causing voltage drop where levels of the sensing voltage, the data voltage, and the reference voltage supplied from the C-PCB are reduced progressively closer to both ends of the display panel. External compensation is sensitive to power supplied to the source driver IC. When the voltage drop occurs, an error occurs in sensing data.

In detail, when the reference voltage is not uniform in the areas of the display panel, a luminance difference occurs. Also, when levels of sensing voltages differ depending on source driver ICs respectively corresponding to the areas of the display panel, noise occurs in the sensing data, causing a defect, such as block dim.

SUMMARY

Accordingly, the present disclosure is directed to an organic light-emitting display device and a driving method thereof that substantially obviate one or more of the issues due to limitations and disadvantages of the related art.

An aspect of the present disclosure is to provide an organic light-emitting display device and a driving method thereof, which prevent occurrence of voltage drop where

levels of a sensing voltage, a data voltage, and a reference voltage are reduced progressively closer to both ends of a display panel.

Additional features and aspects will be set forth in the description that follows, and in part will be apparent from the description, or may be learned by practice of the inventive concepts provided herein. Other features and aspects of the inventive concepts may be realized and attained by the structure particularly pointed out in the written description, or derivable therefrom, and the claims hereof as well as the appended drawings.

To achieve these and other aspects of the inventive concepts as embodied and broadly described, there is provided an organic light-emitting display device, including: a display panel including: a plurality of pixels configured to display an image, each pixel among the plurality of pixels including a driving transistor and a sensing transistor, a plurality of data lines respectively connected to each driving transistor, and a plurality of sensing signal lines respectively connected to each sensing transistor, a plurality of source drive integrated circuits (ICs) configured to: supply data voltages to the plurality of data lines, and supply sensing voltages to the plurality of sensing signal lines, and a timing controller configured to supply digital video data and a data timing control signal to the source driver ICs, wherein each of the plurality of source driver ICs includes a sensing voltage supply unit configured to generate the sensing voltages.

In another aspect, there is provided a method of driving method of an organic light-emitting display device, the driving method including: supplying, by a timing controller, digital video data and a data timing control signal to a plurality of source drive integrated circuits (ICs), supplying, by the source driver ICs, data voltages to a plurality of data lines connected to driving transistors of a plurality of pixels provided in a display panel, generating, by each of the source driver ICs, sensing voltages, and supplying, by the source driver ICs, sensing voltages to a plurality of sensing signal lines connected to sensing transistors of the plurality of pixels provided in a display panel, wherein each of the plurality of source driver ICs includes a sensing voltage supply unit generating the sensing voltages.

Other systems, methods, features and advantages will be, or will become, apparent to one with skill in the art upon examination of the following figures and detailed description. It is intended that all such additional systems, methods, features and advantages be included within this description, be within the scope of the present disclosure, and be protected by the following claims. Nothing in this section should be taken as a limitation on those claims. Further aspects and advantages are discussed below in conjunction with the embodiments of the disclosure. It is to be understood that both the foregoing general description and the following detailed description of the present disclosure are examples and explanatory, and are intended to provide further explanation of the disclosure as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the disclosure and are incorporated in and constitute a part of this specification, illustrate embodiments of the disclosure and together with the description serve to explain various principles of the disclosure.

FIG. **1** is a block diagram illustrating an organic light-emitting display device according to an embodiment of the present disclosure.

FIG. **2** is a circuit diagram illustrating, in detail, a pixel of FIG. **1**.

FIG. **3** is a block diagram illustrating, in detail, a source driver IC according to an embodiment of the present disclosure.

FIG. **4** is a block diagram illustrating, in detail, a source driver IC according to another embodiment of the present disclosure.

FIG. **5** is a circuit diagram of an organic light-emitting display device according to an embodiment of the present disclosure.

FIG. **6** is a waveform diagram of an input sensing voltage with respect to an area of a display panel of an organic light-emitting display device according to an embodiment of the present disclosure.

FIG. **7** is a waveform diagram of an output data voltage with respect to an area of a display panel of an organic light-emitting display device according to an embodiment of the present disclosure.

Throughout the drawings and the detailed description, unless otherwise described, the same drawing reference numerals should be understood to refer to the same elements, features, and structures. The relative size and depiction of these elements may be exaggerated for clarity, illustration, and convenience.

DETAILED DESCRIPTION

Reference will now be made in detail to some embodiments of the present disclosure, examples of which are illustrated in the accompanying drawings. In the following description, when a detailed description of well-known functions or configurations related to this document is determined to unnecessarily cloud a gist of the inventive concept, the detailed description thereof will be omitted. The progression of processing steps and/or operations described is an example; however, the sequence of steps and/or operations is not limited to that set forth herein and may be changed as is known in the art, with the exception of steps and/or operations necessarily occurring in a particular order. Like reference numerals designate like elements throughout. Names of the respective elements used in the following explanations are selected only for convenience of writing the specification and may be thus different from those used in actual products.

In the description of embodiments, when a structure is described as being positioned "on or above" or "under or below" another structure, this description should be construed as including a case in which the structures contact each other as well as a case in which a third structure is disposed therebetween.

FIG. **1** is a block diagram illustrating an organic light-emitting display device according to an embodiment of the present disclosure. FIG. **2** is a circuit diagram illustrating, in detail, a pixel of FIG. **1**.

With reference to FIG. **1**, the organic light-emitting display device according to an embodiment of the present disclosure may include a display panel **10**, a data driver **20**, a scan driver **40**, a sensing driver **50**, a timing controller **60**, and a digital video data compensator **70**. The display panel **10** may include a display area AA and a non-display area NAA near the display area AA. The display area AA may be an area where a plurality of pixels is provided to display an image. A plurality of data lines D**1** to Dm (where m is a

positive integer equal to or greater than two), a plurality of sensing lines SE1 to SEm, a plurality of scan lines S1 to Sn (where n is a positive integer equal to or greater than two), and a plurality of sensing signal lines SS1 to SSn may be provided in the display panel **10**. The data lines D1 to Dm and the sensing lines SE1 to SEm may intersect the scan lines S1 to Sn and the sensing signal lines SS1 to SSn. The data lines D1 to Dm and the sensing lines SE1 to SEm may be parallel to each other, and the scan lines S1 to Sn and the sensing signal lines SS1 to SSn may be parallel to each other.

Each of the pixels may be connected to one corresponding data line of the data lines D1 to Dm, one corresponding sensing line of the sensing lines SE1 to SEm, one corresponding scan line of the scan lines S1 to Sn, and one corresponding sensing signal line of the sensing signal lines SS1 to SSn. The pixels of the display panel **10**, as in the FIG. **2** example, may each include an organic light-emitting diode OLED and a pixel driver PD that supplies a current to the organic light-emitting diode OLED. A detailed description of each of the pixels will be described below with reference to FIG. **2**.

The data driver **20** may receive digital video data DATA, compensation data CDATA, and sensing setting data PDATA from the timing controller **60**. The data driver **20** may respectively supply data voltages to the data lines D1 to Dm by using the digital video data DATA. The data driver **20** may sense a current flowing in each of the sensing lines SE1 to SEm by using the sensing setting data PDATA. The data driver **20** may supply data voltages generated through compensation to the data lines D1 to Dm by using the compensation data CDATA. The data driver **20** may include a sensing data output unit. The data driver **20** may transfer sensing data SD, output from the sensing data output unit, to the timing controller **60**.

Moreover, the data driver **20** may include the sensing driver **50**. The data driver **20** may be connected to the sensing signal lines SS1 to SSn, and may supply sensing signals. The data driver **20** may include a plurality of source driver ICs **21**. A detailed description of each of the source driver ICs **21** will be described below with reference to FIGS. **3** to **5**.

FIG. **3** is a block diagram illustrating in detail, a source driver IC according to an embodiment of the present disclosure. FIG. **4** is a block diagram illustrating, in detail, a source driver IC according to another embodiment of the present disclosure. FIG. **5** is a circuit diagram of an organic light-emitting display device according to an embodiment of the present disclosure.

The scan driver **40** may be connected to the scan lines S1 to Sn, and may supply scan signals. The scan driver **40** may supply the scan signals to the scan lines S1 to Sn according to a scan timing control signal SCS input from the timing controller **60**. The scan driver **40** may sequentially supply the scan signals to the scan lines S1 to Sn. In such case, the scan driver **40** may include a shift register. A scan timing control signal SCS of a display mode may differ from a scan timing control signal SCS of a sensing mode. Therefore, a scan signal waveform of the scan driver **40** in the display mode may differ from a scan signal waveform of the scan driver **40** in the sensing mode.

The scan driver **40** may include a plurality of transistors, and may be directly provided as a gate driver in panel (GIP) type in the non-display area NAA of the display panel **10**. Alternatively, the scan driver **40** may be implemented as a driving chip type, and may be mounted on a flexible film connected to the display panel **10**.

The sensing driver **50** may be connected to the sensing signal lines SS1 to SSn, and may supply sensing signals. The sensing driver **50** may supply the sensing signals to the sensing signal lines SS1 to SSn according to a sensing timing control signal SENCS input from the timing controller **60**. The sensing driver **50** may sequentially supply the sensing signals to the sensing signal lines SS1 to SSn. In such case, the sensing driver **50** may include a shift register. A sensing timing control signal SENCS of the display mode may differ from a sensing timing control signal SENCS of the sensing mode. Therefore, a sensing signal waveform of the sensing driver **50** in the display mode may differ from a sensing signal waveform of the sensing driver **50** in the sensing mode.

The timing controller **60** may receive the digital video data DATA and a timing signal from an external system board. The timing signal may include a vertical sync signal, a horizontal sync signal, a data enable signal, and a dot clock.

The timing controller **60** may generate timing control signals for controlling the operation timings of the data driver **20**, the scan driver **40**, and the sensing driver **50**. The timing control signals may include a data timing control signal DCS of the operation timing of the data driver **20**, a scan timing control signal SCS for controlling the operation timing of the scan driver **40**, and the sensing timing control signal SENCS for controlling the operation timing of the sensing driver **50**.

Moreover, the timing controller **60** may generate a mode signal according to one mode of the display mode and the sensing mode for driving the data driver **20**, the scan driver **40**, the sensing driver **50**, and the digital video data compensator **70**. The timing controller **60** may operate the data driver **20**, the scan driver **40**, and the sensing driver **50** in one mode of the display mode and the sensing mode according to the mode signal. The display mode may be a mode in which the pixels of the display panel **10** display an image, and the sensing mode may be a mode in which each of the pixels of the display panel **10** generates a current of a driving transistor DT thereof. When a waveform of the scan signal and a waveform of the sensing signal supplied to each of the pixels are changed in each of the display mode and the sensing mode, the data timing control signal DCS, the scan timing control signal SCS, and the sensing timing control signal SENCS may also be changed in each of the display mode and the sensing mode. Therefore, the timing controller **60** may generate the data timing control signal DCS, the scan timing control signal SCS, and the sensing timing control signal SENCS, according to one mode of the display mode and the sensing mode.

The timing controller **60** may include the digital video data compensator **70**. The timing controller **60** may supply the compensation data CDATA generated by the digital video data compensator **70** or the sensing setting data PDATA and the data timing control signal DCS to the data driver **20**. The timing controller **60** may output the scan timing control signal SCS to the scan driver **40**. The timing controller **60** may output the sensing timing control signal SENCS to the sensing driver **50**.

The digital video data compensator **70** may be included in the timing controller **60**. The digital video data compensator **70** may store sensing data SD, input from the data driver **20** to the timing controller **60**, in a memory. Also, the digital video data compensator **70** may receive the mode signal from the timing controller **60**. In the display mode, the digital video data compensator **70** may convert the digital video data DATA into the compensation data CDATA, based

on the sensing data SD, thereby compensating for a threshold voltage and an electron mobility of the driving transistor DT.

The sensing data SD may be data that is generated by sensing a current flowing through the driving transistor DT when a certain data voltage is supplied to a gate electrode of the driving transistor DT of each pixel. The compensation data CDATA may be data that is generated by compensating for the digital video data DATA to decrease distortion caused by a characteristic of the driving transistor DT by compensating for the threshold voltage and electron mobility of the driving transistor DT of each of the pixels.

The digital video data compensator **70** may calculate data for compensating for the threshold voltage and electron mobility of the driving transistor DT by using a particular algorithm, based on the sensing data SD. The digital video data compensator **70** may apply the calculated data to the digital video data DATA to calculate the compensation data CDATA. The digital video data compensator **70** may transfer the compensation data CDATA to the timing controller **60** in the display mode. Distortion caused by the characteristic of the driving transistor DT may be reduced more when the timing controller **60** supplies the compensation data CDATA to the source driver IC **21**, than when the timing controller **60** directly supplies the digital video data DATA to the source driver IC **21**.

The digital video data compensator **70** may transfer the sensing setting data PDATA, stored in the memory, to the timing controller **60** in the sensing mode. The sensing setting data PDATA may be data for sensing a current of the driving transistor in each pixel.

With further reference to FIG. **2**, in FIG. **2**, for convenience of description, only a pixel P connected to a j^{th} (where j is a positive integer satisfying $1 \leq j \leq m$) data line Dj, a j^{th} sensing line SEj, a k^{th} (where k is a positive integer satisfying $1 \leq k \leq n$) scan line Sk, and a k^{th} sensing signal line SSk is illustrated. In the FIG. **2** example, the pixel P of the display panel **10** may include an organic light-emitting diode OLED and a pixel driver PD that supplies a current to the j^{th} sensing line SEj.

The pixel driver PD may include a driving transistor DT, a first transistor ST**1** controlled by a scan signal of the scan line Sk, a second transistor ST**2** controlled by a sensing signal of the sensing signal line SSk, and a capacitor C. In the display mode, when the scan signal is supplied through the scan line Sk connected to the pixel P, the pixel driver PD may be supplied with an emission data voltage of the data line Dj connected to the pixel P, and may supply a current of the driving transistor DT to the organic light-emitting diode OLED according to the emission data voltage. In the sensing mode, when the scan signal is supplied through the scan line Sk connected to the pixel P, the pixel driver PD may be supplied with a sensing data voltage of the data line Dj connected to the pixel P, and may supply the current of the driving transistor DT to the sensing line SEj connected to the pixel P.

The organic light-emitting diode OLED may emit light with the current supplied through the driving transistor DT. An anode electrode of the organic light-emitting diode OLED may be connected to a source electrode of the driving transistor DT, and a cathode electrode may be connected to a low-level voltage line ELVSSL through which a low-level source voltage higher than a high-level voltage may be supplied.

The organic light-emitting diode OLED may include the anode electrode, a hole transporting layer, an organic light-emitting layer, an electron transporting layer, and the cathode electrode. When a voltage is applied to the anode electrode and the cathode electrode, a hole and an electron may respectively move to the organic light-emitting layer through the hole transporting layer and the electron transporting layer, and may be combined with each other in the organic light-emitting layer to emit light.

The driving transistor DT may be provided between a high-level voltage line ELVDDL and the organic light-emitting diode OLED. The driving transistor DT may control a current flowing from the high-level voltage line ELVDDL to the organic light-emitting diode OLED, based on a voltage difference between a gate electrode and a source electrode of the driving transistor DT. The gate electrode of the driving transistor DT may be connected to a first electrode of the first transistor ST**1**, the source electrode may be connected to the anode electrode of the organic light-emitting diode OLED, and a drain electrode may be connected to the high-level voltage line ELVDDL through which a high-level voltage is supplied.

The first transistor ST**1** may be turned on by a k^{th} scan signal of the k^{th} scan line Sk, and may supply a voltage of the j^{th} data line Dj to the gate electrode of the driving transistor DT. A gate electrode of the first transistor ST**1** may be connected to the k^{th} scan line Sk, a first electrode may be connected to the gate electrode of the driving transistor DT, and a second electrode may be connected to the j^{th} data line Dj. The first transistor ST**1** may be referred to as a "scan transistor."

The second transistor ST**2** may be turned on by a k^{th} sensing signal of the k^{th} sensing signal line SSk, and may connect the j^{th} sensing line SEj to the source electrode of the driving transistor DT. A gate electrode of the second transistor ST**2** may be connected to the k^{th} sensing signal line SSk, a first electrode may be connected to the j^{th} sensing line SEj, and a second electrode may be connected to the source electrode of the driving transistor DT. The second transistor ST**2** may be referred to as a "sensing transistor."

The capacitor C may be provided between the gate electrode and the source electrode of the driving transistor DT. The capacitor C may store a difference voltage between a gate voltage and a source voltage of the driving transistor DT.

In FIG. **2**, an example in which the driving transistor DT and the first and second transistors ST**1** and ST**2** are each formed of an N-type metal oxide semiconductor field effect transistor (MOSFET) has been described, but embodiments of the present disclosure are not limited thereto. For example, the driving transistor DT and the first and second transistors ST**1** and ST**2** may each be formed of a P-type MOSFET. Also, the first electrode may be a source electrode, and the second electrode may be a drain electrode, but embodiments of the present disclosure are not limited thereto. In some embodiments, the first electrode may be a drain electrode, and the second electrode may be a source electrode.

In the display mode, when the scan signal is supplied to the k^{th} scan line Sk, an emission data voltage of the j^{th} data line Dj may be supplied to the gate electrode of the driving transistor DT. Also, when the sensing signal is supplied to the k^{th} sensing signal line SSk, a reference voltage of the j^{th} sensing line SEj may be supplied to the source electrode of the driving transistor DT. Therefore, in the display mode, a current of the driving transistor DT that flows according to a voltage difference between a voltage at the gate electrode and a voltage at the source electrode of the driving transistor DT may be supplied to the organic light-emitting diode OLED, and the organic light-emitting diode OLED may

emit light with the current of the driving transistor DT. In such a case, the emission data voltage may be a voltage generated by compensating for a threshold voltage and an electron mobility of the driving transistor DT. Thus, the current of the driving transistor DT may not depend on the threshold voltage and electron mobility of the driving transistor DT.

In the sensing mode, when the scan signal is supplied to the k^{th} scan line Sk, a sensing data voltage of the j^{th} data line Dj may be supplied to the gate electrode of the driving transistor DT. Also, when the sensing signal is supplied to the k^{th} sensing signal line SSk, the reference voltage of the j^{th} sensing line SEj may be supplied to the source electrode of the driving transistor DT. Furthermore, in the sensing mode, the second transistor ST**2** may be turned on by the sensing signal of the k^{th} sensing signal line SSk. Thus, the current of the driving transistor DT that flows according to the voltage difference between the voltage at the gate electrode and the voltage at the source electrode of the driving transistor DT may flow to the j^{th} sensing line SEj. As a result, the sensing data output unit may sense a current flowing in the j^{th} sensing line SEj to output sensing data SD, and the digital video data compensator **70** may perform external compensation on the threshold voltage and electron mobility of the driving transistor DT by using the sensing data SD.

With reference to FIG. **3**, the source driver IC may be provided in plurality, and the plurality of source driver ICs may each include a data voltage supply unit **110**, a switching unit **120**, an initialization voltage supply unit **130**, and a sensing voltage supply unit **150**. In FIG. **3**, for convenience of description, an example in which the data voltage supply unit **110** is connected to p (where p is a positive integer satisfying $1 \leq p \leq m$) number of data lines D**1** to Dp and the switching unit **120**, and the initialization voltage supply unit **130** are connected to p number of sensing lines SE**1** to SEp, will be described below.

The data voltage supply unit **110** may be connected to the data lines D**1** to Dp and may supply data voltages. The data voltage supply unit **110** may receive compensation data CDATA or sensing setting data PDATA, and a data timing control signal DCS, from the timing controller **60**. In the display mode, the data voltage supply unit **110** may convert the compensation data CDATA into emission data voltages, and may respectively supply the emission data voltages to the data lines D**1** to Dp according to the data timing control signal DCS. Each of the emission data voltages may be a voltage for allowing an organic light-emitting diode OLED of a pixel to emit light having a particular luminance. In one example, if the compensation data CDATA supplied to the data driver **20** consists of 8 bits, each of the emission data voltages may be supplied as one of 256 voltages, although embodiments are not limited thereto. In the sensing mode, the data voltage supply unit **110** may convert the sensing setting data PDATA into sensing data voltages, and may respectively supply the sensing data voltages to the data lines D**1** to Dp according to the data timing control signal DCS. Each of the sensing data voltages may be a voltage for sensing a current of a driving transistor DT of the pixel.

The switching unit **120** may be connected to the sensing lines SE**1** to SEp and the sensing data output unit **30**. The switching unit **120** may connect the sensing lines SE**1** to SEp to the sensing data output unit **30** in a particular order. For example, the particular order may be a sequential order. In such a case, the switching unit **120** may sequentially connect the sensing data output unit **30** to a first sensing line SE**1** to a p^{th} sensing line SEp.

The switching unit **120** may include a plurality of first switches SW**11** to SW**1***p* respectively connected to the sensing lines SE**1** to SEp. The switching unit **120** may switch on the first switches SW**11** to SW**1***p* according to first switch signals SCS**1** input from the timing controller **60**, thereby connecting the sensing lines SE**1** to SEp to the sensing data output unit **30** in a particular order.

The initialization voltage supply unit **130** may be connected to the sensing lines SE**1** to SEp, and may supply an initialization voltage. The initialization voltage supply unit **130** may include a plurality of initialization switches SWR**1** to SWRp. The initialization voltage supply unit **130** may switch on the initialization switches SWR**1** to SWRp according to the initialization signal input from the timing controller **60**, thereby connecting the sensing lines SE**1** to SEp to a reference voltage line VREFL through which a reference voltage may be supplied. The initialization switches SWR**1** to SWRp may receive the same initialization signal.

The reference voltage supply unit **140** provided outside the source driver IC **21** may generate the reference voltage for controlling a luminance of the entire display area AA of the display panel **10**. The reference voltage supply unit **140** may be connected to the reference voltage line VREFL. The reference voltage supply unit **140** may transfer the generated reference voltage to the initialization voltage supply unit **130** through the reference voltage line VREFL.

The sensing data output unit **30** may be included in the source driver IC **21**. The sensing data output unit **30** may be connected to the sensing lines SE**1** to SEp by the switching unit **120**, and may sense currents flowing in the sensing lines SE**1** to SEp. That is, the sensing data output unit **30** may convert the current, flowing in each of sensing lines SE**1** to SEp, the into a voltage, and may convert the voltage into sensing data SD including information for sensing and compensation. The sensing data output unit **30** may output the sensing data SD to the timing controller **60**. Therefore, the timing controller **60** may sense whether or not a data voltage is normal, based on the sensing data SD, and may perform compensation.

The sensing voltage supply unit **150** may be included in the source driver IC **21**. The sensing voltage supply unit **150** may perform a function of the sensing driver **50** of the FIG. **1** example. The sensing voltage supply unit **150** may supply a sensing signal, which may be necessary for sensing, to each of the sensing signal lines SS**1** to SSn. Each of the sensing signal lines SS**1** to SSn, as described above with reference to FIG. **2**, may supply the sensing signal to turn on the second transistor ST**2** that performs a sensing operation. Accordingly, the sensing signal may be a voltage that is supplied to a pixel for performing sensing, and thus, may be defined as a sensing voltage.

The sensing voltage supply unit **150** may be included in each of the source driver ICs **21**. The sensing voltage may be generated in each of the source driver ICs **21**, and may be supplied to each of the sensing signal lines SS**1** to SSn. When the sensing voltage is generated in each of the source driver ICs **21** and is supplied to each of the sensing signal lines SS**1** to SSn, a sensing voltage suitable for an area characteristic of the display panel **10** may be supplied.

The area characteristic of the display panel **10** denotes a block-based characteristic of the display area AA of the display panel **10**. The area characteristic of the display panel **10** is shown when the display panel **10** includes a large-size display area AA. The area characteristic of the display panel **10** denotes a characteristic in which a level of a supplied voltage is reduced progressively closer to both ends, e.g., the

left and right sides, of the display panel **10**. This may occur because, due to a length difference of lines connected between a C-PCB and the display panel **10**, voltage drop caused by a resistance of each of the lines increases progressively closer to both ends of the display panel **10**. Another cause may be a difference between physical characteristics of the pixels provided in the display panel **10**.

The area characteristic of the display panel **10** may be defined as voltage drop in which levels of the sensing voltage, the data voltage, and the reference voltage supplied from the C-PCB are reduced progressively closer to the both ends of the display panel **10**. External compensation may be sensitive to power that is supplied to the source driver IC **21**, and may be necessary for sensing. Thus, when the voltage drop occurs, an error may occur in sensing data.

When the sensing voltage supply unit **150** is included in each of the source driver ICs **21**, a sensing voltage corresponding to the area characteristic of the display panel **10** connected to each of the source driver ICs **21** may be supplied. In detail, each of the sensing voltage supply units **150** may supply a sensing voltage to supply a uniform data voltage to the entire display area, and may prevent a luminance difference caused by the area characteristic of the display panel **10**.

For each of the source driver ICs **21** to supply the sensing voltage suitable for the area characteristic of the display panel **10**, the sensing voltage supply unit **150** may be supplied with a sensing power control signal from the timing controller **60**. The sensing power control signal may be included in an embedded point-to-point interface (EPI) packet protocol, which is a communication protocol set for transmitting a rising time of a clock and color-based digital video data of each pixel, when supplying the digital video data DATA to the source driver IC **21** through an output terminal of the timing controller **60**. The EPI packet protocol may include a plurality of bits (for example, 24 bits) for each frame, although embodiments are not limited thereto. One of dummy bits included in the EPI packet protocol may be set as a bit for controlling a logic level of the sensing voltage of the sensing voltage supply unit **150** included in the source driver IC **21**. The timing controller **60** may set bits included in the EPI packet protocol to have different sensing voltages for each of the source driver ICs **21**. Accordingly, the timing controller **60** may individually control a level of the sensing voltage output from the sensing voltage supply unit **150**.

In an embodiment of the present disclosure, when each of the source driver ICs **21** includes the sensing voltage supply unit **150**, the source driver IC **21** connected to an area where luminance has been reduced may supply a high sensing voltage, thereby performing external compensation to supply a data voltage and a reference voltage to a corresponding area at a high level. On the other hand, the source driver IC **21** connected to an area where luminance has increased may supply a low sensing voltage, thereby performing external compensation to supply the data voltage and the reference voltage to a corresponding area at a low level. Accordingly, external compensation for decreasing a luminance deviation between the areas of the display panel **10** may be performed.

With reference to FIG. **4**, the source driver IC **21** according to another embodiment of the present disclosure is the same as the source driver IC **21** according to an embodiment of the present disclosure illustrated in FIG. **3**, except that a reference voltage supply unit **140** may be included in the source driver IC **21**. In a case in which the reference voltage supply unit **140** is included in the source driver IC **21**, as in the source driver IC **21** according to another embodiment of the present disclosure, a reference voltage generated by the reference voltage supply unit **140** may be transferred to an initialization voltage supply unit **130** in the source driver IC **21** that is provided in plurality.

When the reference voltage supply unit **140** is included in each of the source driver ICs **21**, the reference voltage may be supplied based on the area characteristic of the display panel **10** connected to each of the source driver ICs **21**. Therefore, a deviation of a level of the reference voltage based on the area of the display panel **10** may be reduced in comparison with a case in which an external reference voltage supply unit **140** supplies the reference voltage to the entire display panel **10**. The reference voltage may control a luminance of the entire display area AA. Thus, when the level of the reference voltage becomes uniform, luminance may become uniform. Accordingly, when the reference voltage supply unit **140** is included in each of the source driver ICs **21**, a luminance of the display area AA may become uniform, and block dim may be prevented.

With reference to FIG. **5**, in a display panel **10** of the organic light-emitting display device **10** according to an embodiment of the present disclosure, a display area AA may be divided into a plurality of display area blocks AA**1** to AA**5**. In FIG. **5**, an example in which the display area AA is divided into five display area blocks AA**1** to AA**5** is illustrated, but embodiments are not limited thereto. In some embodiments, depending on the case, the display area AA may be divided into fewer or more display area blocks than the number of illustrated blocks.

In each of the display area blocks AA**1** to AA**5**, a plurality of sensing signal lines SS and a plurality of sensing lines SE may be arranged to respectively extend from a plurality of source driver ICs **21**. Therefore, the number of the display area blocks may be the same as the number of the source driver ICs **21**. Accordingly, in FIG. **5**, because the number of the source driver ICs **21** is five, an example in which the number of the display area blocks AA**1** to AA**5** is five is illustrated.

The sensing signal lines SS and the sensing lines SE extending from the respective source driver ICs **21** may be connected to pixels provided in the display area blocks AA**1** to AA**5**. Although not shown in FIG. **5**, as described above with reference to FIG. **2**, each of the sensing signal lines SS may be connected to a gate electrode of a second transistor ST**2** of a pixel, and may supply a sensing voltage for starting sensing. Each of the sensing lines SE may be connected to a drain electrode of the second transistor ST**2**, and may sense a sensing current. Portions of sensing data for performing external compensation may be generated based on the sensing voltage and the sensing current.

In one example, the sensing signal lines SS and the sensing lines SE may not be connected to each other between adjacent display area blocks. Therefore, each of the source driver ICs **21** may supply a sensing voltage having a level corresponding to a characteristic of a corresponding display area block of the display area blocks AA**1** to AA**5**.

A timing controller **60** may include a digital video data compensator **70** and may be mounted on a C-PCB **80**. Functions of the timing controller **60** and the digital video data compensator **70** are substantially similar to the functions described above with reference to FIG. **1**. Thus, their detailed descriptions are omitted.

The source driver ICs **21** may be respectively mounted on a plurality of flexible films **90**. Each of the flexible films **90** may be a tape carrier package (TCP) or a chip on film (COF). The COF may include a base film, such as polyimide, and a plurality of conductive lead lines provided on the base film. The flexible films **90** may be bent or curved. The

flexible films **90** may each be attached on the display panel **10** and the C-PCB **80**. For example, each of the flexible films **90** may be attached on the display panel **10** in a tape automated bonding (TAB) type by using an anisotropic conductive film (ACF). Thus, the source driver ICs **21** may be connected to the sensing signal lines SS and the sensing lines SE.

FIG. **6** is a waveform diagram of an input sensing voltage with respect to an area of a display panel of an organic light-emitting display device according to an embodiment of the present disclosure. FIG. **7** is a waveform diagram of an output data voltage with respect to an area of a display panel of an organic light-emitting display device according to an embodiment of the present disclosure.

For example, as described above, data voltages of display area blocks AA**1** and AA**5** disposed in both ends among a plurality of display area blocks AA**1** to AA**5** may be lower than a data voltage of the display area block AA**3** disposed in a center portion. Because a difference may occur between the data voltage of each of the display area blocks AA**1** and AA**5** disposed in the both ends and the data voltage of the display area block AA**3** disposed in the center portion, a luminance deviation between the display area blocks AA**1** to AA**5** may occur.

To decrease a luminance deviation between the display area blocks AA**1** and AA**5**, each of the source driver ICs **21** may supply sensing voltages Vsen for reducing the luminance deviation between the display area blocks AA**1** and AA**5**. As such, the source driver IC **21** connected to the sensing signal lines SS and the sensing lines SE in the display area blocks AA**1** and AA**5** disposed in the both ends may supply the sensing voltage Vsen at a first logic level V**1**. The source driver IC **21** connected to the sensing signal lines SS and the sensing lines SE in the display area blocks AA**2** and AA**4**, instead of the ends (e.g., the display area blocks AA**1** and AA**5**) and the center portion, may supply the sensing voltage Vsen at a second logic level V**2**. Also, the source driver IC **21** connected to the sensing signal lines SS and the sensing lines SE in the display area block AA**3** in the center portion may supply the sensing voltage Vsen at a third logic level V**3**.

The first logic level V**1** may be higher than the second logic level V**2**, and the third logic level V**3** may be lower than the second logic level V**2**. Therefore, in the display area blocks AA**1** and AA**5** disposed at the two ends, external compensation may be performed to increase a data voltage that is supplied based on the sensing voltage having the first logic level V**1**. In the display area blocks AA**2** and AA**4**, instead of the ends and the center portion, to maintain the sensing voltage having the second logic level V**2** supplied based on the sensing voltage having the second logic level V**2**, external compensation may not be performed, or only slight compensation for reducing or removing a voltage ripple may be performed. Also, in the display area block A**3** in the center portion, external compensation may be performed to lower a data voltage that may be supplied based on the sensing voltage having the third logic level V**3**.

External compensation may be performed for each of the display area blocks AA**1** to AA**5**. Then, as shown in the FIG. **7** example, all of the display area blocks AA**1** to AA**5** may have a data voltage Vdata having the second logic level V**2**. The data voltage Vdata having the same level may be supplied to all of the display area blocks AA**1** to AA**5**, thereby decreasing or removing a luminance deviation between the display area blocks AA**1** to AA**5**.

The data lines Dj connected to the driving transistors DT of the pixels P displaying an image, and the sensing signal lines SS connected to the sensing transistors ST**2** of the pixels P, may be arranged in the display panel **10** of the organic light-emitting display device according to an embodiment of the present disclosure. As illustrated in the example of FIG. **2**, when each of the scan lines Sk turns on the first transistor ST**1**, each of the data lines Dj may be connected to the gate electrode of the driving transistor DT. Each of the sensing signal lines SS may be connected to the gate electrode of the second transistor ST**2**. When a sensing signal is supplied through each of the sensing signal lines SS, the second transistor DT may be turned on, and sensing data for external compensation may be sensed through the sensing lines SS. Accordingly, because the sensing signal may be a signal for starting sensing, the sensing signal may be defined as a "sensing voltage," and because the second transistor ST**2** may transfer the sensing data to the sensing lines SE, the second transistor ST**2** may be defined as a "sensing transistor."

The source driver IC **21** of the organic light-emitting display device according to an embodiment of the present disclosure may supply the data voltages Vdata to the data lines Dj, and may supply the sensing voltages Vsen to the sensing signal lines SS. Each of the source driver ICs **21** may include the sensing voltage supply unit **150** that may generate the sensing voltages Vsen. In each of the source driver ICs **21**, the sensing voltage supply unit **150** may generate the sensing voltages Vsen, based on a characteristic of a display area block connected thereto, and may supply the sensing voltages Vsen to the display area block.

The timing controller **60** may supply the digital video data DATA and the data timing control signal DCS to the source driver IC **21**. The timing controller **60** may supply the sensing power control signal, which may control the sensing voltage supply unit **150**, to the source driver IC **21**. The timing controller **60** may add a bit for controlling a sensing power into the EPI packet protocol, which is supplied from the output terminal to the source driver IC **21**, and may supply the sensing power control signal to the source driver IC **21**. Accordingly, the timing controller **60** may control each of the source driver ICs **21** to generate the sensing voltage Vsen, based on a characteristic of a display area block.

In one example, the source driver ICs **21** may each include a digital-analog converter (DAC) that may generate the sensing voltages Vsen corresponding to sensing power information transmitted according to the EPI packet protocol. The DAC may generate the sensing voltages Vsen to be supplied to corresponding pixels, based on the sensing power information transmitted according to the EPI packet protocol, and may supply the sensing voltages Vsen to the sensing signal lines SS.

At this time, the timing controller **60** may supply a DAC control signal, which may control the DAC, to the source driver ICs **21**. As described above, a difference between data voltages supplied to the display area blocks AA**1** to AA**5** may occur due to a resistance value difference caused by a length difference between lines and a physical difference between the pixels provided in the display area blocks AA**1** to AA**5**. The timing controller **60** may be supplied overall with information about the difference between the data voltages. To decrease the difference, the timing controller **60** may control the source driver ICs **21** to generate different sensing voltages Vsen. Therefore, in a case in which the timing controller **60** directly supplies the DAC control signal for controlling the DAC to the source driver ICs **21**, a deviation between data voltages of the display area blocks AA**1** to AA**5** may be more easily reduced or removed.

The source driver ICs **21** according to an embodiment of the present disclosure may supply the sensing voltages Vsen to reduce a luminance deviation between the display area blocks AA**1** to AA**5**. As described above, the source driver ICs **21** may supply different sensing voltages Vsen to the display area blocks. To reduce a deviation, each of the source driver ICs **21** may supply the sensing voltage Vsen having a high logic level to a display area block where the data voltage Vdata was low, and may supply the sensing voltage Vsen having a low logic level to a display area block where the data voltage Vdata was high. In such a case, external compensation may be performed for each of the display area blocks AA**1** to AA**5**. Then, all of the display area blocks AA**1** to AA**5** may have the data voltage Vdata having the second logic level V**2**. Accordingly, the data voltage Vdata having the same level may be supplied to all of the display area blocks AA**1** to AA**5**, thereby reducing or removing the luminance deviation between the display area blocks AA**1** to AA**5**.

As described above, in an embodiment of the present disclosure, the reference voltage supply unit **40** may be included in each of the source driver ICs **21**. In such a case, the reference voltage may be supplied based on an area characteristic of the display panel **10** connected to each of the source driver ICs **21**. Therefore, a deviation of a level of the reference voltage based on the area of the display panel **10** may be reduced in comparison with a case in which the external reference voltage supply unit **140** supplies the reference voltage to an entire area of the display panel **10**, e.g., to the entire display panel **10**. The reference voltage may control a luminance of the entire display area AA. Thus, when the level of the reference voltage becomes uniform, luminance may become uniform. Accordingly, when the reference voltage supply unit **140** is included in each of source driver ICs **21**, a luminance of the display area AA may become uniform, and block dim may be prevented.

A driving method of an organic light-emitting display device according to an embodiment of the present disclosure may include the following operations. First, the timing controller **60** may supply the digital video data DATA and the data timing control signal DCS to the source driver IC **21**. In such a case, the driving method may include an operation of supplying, by the timing controller **60**, the sensing power control signal for controlling the sensing voltage supply unit **150** to the source driver IC **21**. Therefore, the timing controller **60** may control each of the source driver ICs **21** to generate the sensing voltage Vsen, based on a characteristic of a display area block.

In one example, the driving method may include an operation of supplying, by the timing controller **60**, the DAC control signal for controlling the DAC to the source driver IC **21**. In a case in which the timing controller **60** directly supplies the DAC control signal for controlling the DAC to the source driver ICs **21**, a deviation between data voltages of the display area blocks AA**1** to AA**5** may be more easily reduced or removed.

Second, the source driver IC **21** may supply the data voltages to the data lines Dj connected to the driving transistors DT of the pixels provided in the display panel **10**. In another example, the reference voltage supply unit **140** included in the source driver IC **21** may supply the reference voltage for controlling a luminance of entire the display area AA of the display panel **10**. In such a case, the driving method may include an operation of supplying the reference voltage based on an area characteristic of the display panel **10** connected to each of the source driver ICs **21**. When the reference voltage supply unit **140** is included in each of the source driver ICs **21**, the reference voltage may be supplied based on a characteristic of each of the display area blocks. Accordingly, by uniformly supplying the reference voltage, a luminance of the display area AA may become uniform, and block dim may be prevented.

Third, each of the source driver ICs **21** may generate the sensing voltages Vsen. The source driver ICs **21** may each include the sensing voltage supply unit **150** that may sense the sensing voltages Vsen. In the above-described example, the driving method may include an operation of generating, by the DAC of the source driver IC **21**, the sensing voltages Vsen based on the sensing power information transmitted according to the EPI packet protocol.

Fourth, the source driver IC **21** may supply the sensing voltages to the sensing signal lines SS connected to the sensing transistors ST**2** of the pixels provided in the display panel **10**. In such a case, the driving method may include an operation of supplying the sensing voltage Vsen having a high logic level to a display area block where the data voltage Vdata was low, and supplying the sensing voltage Vsen having a low logic level to a display area block where the data voltage Vdata was high. Accordingly, the data voltage Vdata having the same level may be supplied to all of the display area blocks AA**1** to AA**5**, thereby reducing or removing the luminance deviation between the display area blocks AA**1** to AA**5**.

As described above, according to embodiments of the present disclosure, the sensing voltage supply unit may be included in each of the source driver ICs. Also, the sensing signal lines connected to each of the source driver ICs may be divided in units of one display area block. Each of the source driver ICs may supply a sensing voltage corresponding to a characteristic of a corresponding display area block. For example, the sensing voltage may be supplied to decrease a deviation of data voltages of the display panel. Accordingly, voltage drop, in which levels of a sensing voltage, a data voltage, and a reference voltage are reduced progressively closer to ends of the display panel, may be prevented.

It will be apparent to those skilled in the art that various modifications and variations may be made in the present disclosure without departing from the technical idea or scope of the disclosure. Thus, it is intended that embodiments of the present disclosure cover the modifications and variations of the disclosure provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. An organic light-emitting display device, comprising:

a display panel including:

a plurality of pixels configured to display an image, each pixel among the plurality of pixels including a driving transistor and a sensing transistor;

a plurality of data lines respectively connected to each driving transistor; and

a plurality of sensing signal lines respectively connected to each sensing transistor;

a plurality of source drive integrated circuits (ICs) individually connected to each of display area blocks, and configured to:

supply data voltages to the plurality of data lines; and

supply sensing voltages to the plurality of sensing signal lines; and

a timing controller configured to supply digital video data and a data timing control signal to each of the plurality of source driver ICs,

wherein each of the plurality of source driver ICs comprises a sensing voltage supply unit configured to:

generate a respective sensing voltage among the sensing voltages, the respective sensing voltage having a respective level based on a characteristic of a display area block connected thereto, the characteristic including a length difference between lines connected between the timing controller and the display panel, and

supply the respective sensing voltage to the display area block connected thereto.

2. The organic light-emitting display device of claim **1**, wherein the timing controller is further configured to supply a sensing power control signal, for controlling the sensing voltage supply unit, to each of the plurality of source driver ICs.

3. The organic light-emitting display device of claim **2**, wherein:

each source driver IC includes a digital-analog converter (DAC) configured to generate the sensing voltages corresponding to sensing power information transmitted according to an embedded point-to-point interface (EPI) packet protocol; and

the timing controller is further configured to supply a DAC control signal, for controlling the DAC, to each of the plurality of source driver ICs.

4. The organic light-emitting display device of claim **1**, wherein each of the plurality of source driver ICs is further configured to:

supply a sensing voltage having a high logic level to the display area block where a data voltage is determined to be low; and

supply a sensing voltage having a low logic level to the display area block where a data voltage is determined to be high.

5. The organic light-emitting display device of claim **1**, wherein each of the plurality of source driver ICs comprises a reference voltage supply unit configured to:

supply a reference voltage for controlling a luminance of the display area block of the display panel; and

supply the reference voltage based on an area characteristic of the display area block connected to each of the plurality of source driver ICs.

6. A driving method of an organic light-emitting display device, the driving method comprising:

supplying, by a timing controller, digital video data and a data timing control signal to each of a plurality of source drive integrated circuits (ICs) connected to each of display area blocks;

supplying, by each of the plurality of source driver ICs, data voltages to a plurality of data lines connected to driving transistors of a plurality of pixels provided in the display area block;

generating, by each of the plurality of source driver ICs, a respective sensing voltage having a respective level based on a characteristic of a display area block connected thereto, the characteristic including a length difference between lines connected between the timing controller and the display panel; and

supplying, by each of the plurality of source driver ICs, the respective sensing voltage to a plurality of sensing signal lines connected to sensing transistors of the plurality of pixels provided in the display area block,

wherein each of the plurality of source driver ICs comprises a sensing voltage supply unit generating the respective sensing voltage.

7. The driving method of claim **6**, wherein the supplying of the digital video data and the data timing control signal comprises supplying a sensing power control signal, for controlling the sensing voltage supply unit, to each of the plurality of source driver ICs.

8. The driving method of claim **7**, wherein:

the generating of the sensing voltages comprises, by using a digital-analog converter (DAC) of each of the plurality of source driver ICs, generating the sensing voltages corresponding to sensing power information transmitted according to an embedded point-to-point interface (EPI) packet protocol; and

the supplying of the digital video data and the data timing control signal further comprises supplying a DAC control signal, for controlling the DAC, to each of the plurality of source driver ICs.

9. The driving method of claim **6**, wherein the supplying of the sensing voltages comprises:

supplying a sensing voltage having a high logic level to a display area block where a data voltage is determined to be low; and

supplying a sensing voltage having a low logic level to a display area block where a data voltage is determined to be high.

10. The driving method of claim **6**, wherein the supplying of the data voltages comprises supplying, by a reference voltage supply unit included in each of the plurality of source driver ICs, a reference voltage for controlling a luminance of the display area block of the display panel, the reference voltage being supplied based on an area characteristic of the display area block connected to each of the plurality of source driver ICs.

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